CTI 2558
EIGHT CHANNEL ANALOG INPUT MODULE
INSTALLATION AND OPERATION GUIDE
Version 1.2

CTI Part #
062-00331-012

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REVISION HISTORY

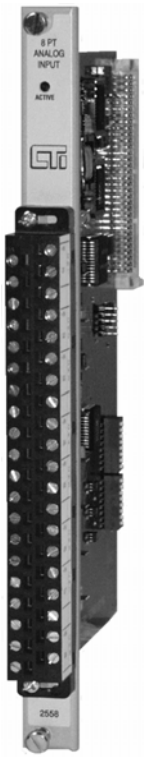
Version 1.0	4/30/01	Original Release
Version 1.1	5/30/01	Add 1 bit of resolution to 16 bit compatibility.
Version 1.2	4/3/03	Add return-common jumpers

PREFACE

This ***Installation and Operation Guide*** provides installation and operation instructions for the CTI 2558 Eight Channel Isolated Analog Input Model for SIMATIC® 505 programmable controllers. We assume you are familiar with the operation of SIMATIC® 505 series programmable controllers. Refer to the appropriate 505 user documentation for specific information on the SIMATIC® 505 programmable controllers and I/O modules.

This ***Installation and Operation Guide*** is organized as follows:

Chapter 1 provides a description of the module.
Chapter 2 covers installation and wiring.
Chapter 3 is a guide to troubleshooting.
Appendix A details compatibility between the 2558 and the Siemens505-6108-A and 505-6108-B.



The Model 2558 8-Channel Analog Input Module

USAGE CONVENTIONS

NOTE:
Notes alert the user to special features or procedures.

CAUTION:
Cautions alert the user to procedures that could damage equipment.

WARNING:
Warnings alert the user to procedures that could damage equipment and endanger the user.

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CHAPTER 1. OVERVIEW

1.0. Product Summary

The CTI 2558 Eight Channel Analog Input Module is a member of Control Technology's family of I/O modules compatible with the SIMATIC® 505 programmable controllers. It is designed to translate an analog input signal into an equivalent digital word which is then sent to the programmable controller (PLC).

1.1. Front Panel Description

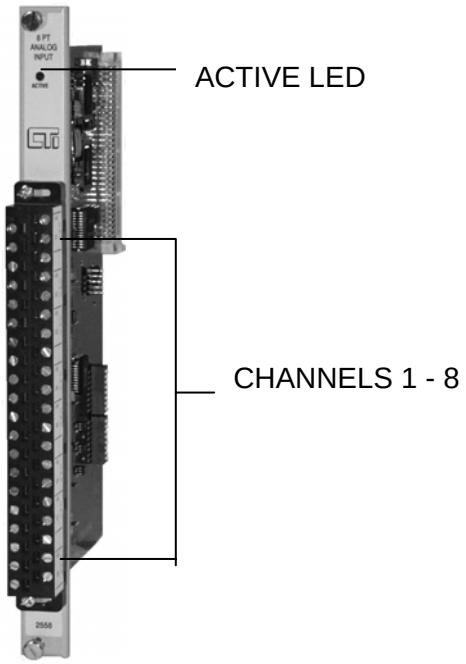


Figure 1.1 CTI 2558 Front Panel

1.1.1. Active LED

The Active LED will be illuminated when the module is functioning normally. If the Active LED is not lit, or if it is blinking, refer to Chapter 3 for troubleshooting.

1.1.2. Input Connector for Channels 1-8

This connector provides wiring terminals for Channels 1-8 for either voltage or current inputs. The wiring connector accepts 14-22 AWG wire.

1.2. Asynchronous Operation

The module operates asynchronously with respect to the PLC (a scan of the PLC and input sampling of the module do not occur at the same time). Instead, the module will translate all analog inputs in one module update (5 milliseconds maximum) and store the translated words in buffer memory. The PLC retrieves the stored words from the module buffer memory at the start of the I/O scan.

1.3. Immediate I/O

The Model 2558 Analog Input Module is fully compatible with the immediate input instruction for the TI545 and 555 PLCs.

1.4. Unipolar or Bipolar Mode

Each input channel may be configured to accept either bipolar or unipolar input signals. Selection of unipolar of bipolar mode is made via an internal jumper (see Section 2.3.3).

1.5. Voltage or Current Mode

Each of the module's eight channels may be configured to receive either voltage or current analog input signals. For unipolar input signals, the range is 0 to 5 VDC, 0 to 10 VDC or 0 to +20 mA. For bipolar input signals, the signal range is –5 to +5 VDC, -10 to +10 VDC or –20 to +20 mA. Selection of voltage or current mode and voltage range are made via internal jumpers (see Sections 2.3.1 and 2.3.2).

1.6. Using an Input with 20% Offset

Some applications use transducers that provide 1 to 5 volts (4 to 20mA) input signals instead of 0 to 5 volt (0 to 20mA) input signals. You can allow for this 20% offset by including some additional instructions in your RLL (Relay Ladder Logic) program.

First, subtract 6400 from the input data word (WX). Then, multiply the result by 125 and divide the product by 100. This yields the following equation:

$$(WX - 6400) \times 125 \div 100 = \text{20\% offset data word}$$

Consult your PLC programming manual (or program design guide) for information about RLL instructions used in the conversion.

1.7. Using the Module with 20% Offset

If all eight inputs are used in offset mode the Model 2558 may be configured to perform the offset calculation automatically (see Figure 2.2 Configuration Jumper Board Locations). Jumper JP40 when enabled will configure the module such that all inputs will be scaled for 1-5VDC or 4-20mA operation. No further relay ladder logic is required for input processing.

1.8. Digital Word Map: 13 Bit Mode

A unipolar analog input signal is translated into a 13-bit plus sign bit digital word. Since the PLC requires a 16-bit input word, the 13-bit value from the converter is placed into a 16-bit word for transmittal to the PLC. As shown in the following figure, of the two bits not used for the digital word, one is used to show the sign of the word and one is used to note values which are “overrange”.

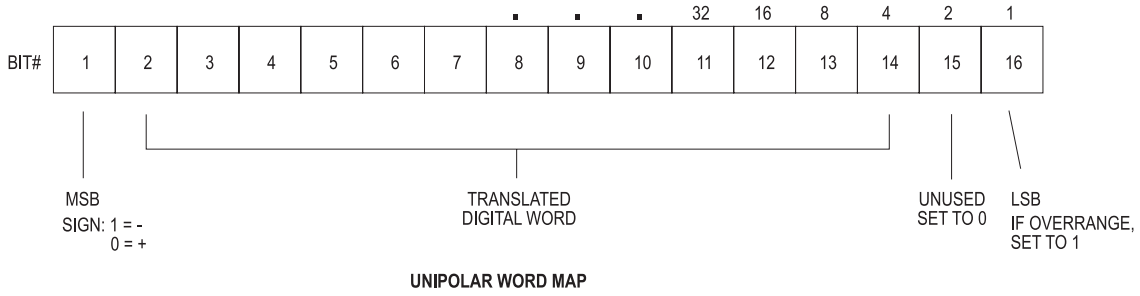


Figure 1.2 13 Bit Word Input to the PLC from the Module

1.9. Analog to Digital Conversions: 13 Bit Mode

1.9.1. Unipolar Mode Conversion

The following equations may be used to calculate the digital word which will result from a particular voltage or current input in the Unipolar Input Mode:

0 to +5VDC range	Digital Word (WX) = (Input voltage x 32000) ÷ 5 volts example: to generate an input voltage of 2.5 VDC, the WX value input to the PLC is calculated as follows: WX = (2.5 x 32000) ÷ 5 = 16000
0 to +10VDC range	Digital Word (WX) = (Input voltage x 32000) ÷ 10 volts example: 7.5VDC input WX = (7.5 x 32000) ÷ 10 = 24000
0 to +20mA range	Digital Word (WX) = (Input current x 32000) ÷ 20 mA example: 10mA input WX = (10 x 32000) ÷ 20 = 16000

Note:
Bit 15 is always returned as a zero, and bit 16 is employed as an over/underrange bit. Consequently, returned data values change by four.

1.9.2. Bipolar Mode Conversion

The following equations may be used to calculate the digital word which will result from a particular voltage or current input in the Bipolar Input Mode:

-5 to +5VDC range	Digital Word (WX) = (Input voltage x 32000) ÷ 5 volts example: to generate an input voltage of -2.5 VDC, the WX value input from the PLC is calculated as follows: WX = (-2.5 x 32000) ÷ 5 = -16000
-10 to +10VDC range	Digital Word (WX) = (Input voltage x 32000) ÷ 10 volts example: 10 VDC input WX = (10 x 32000) ÷ 10 = 32000
-20 to +20mA range	Digital Word (WX) = (Input current x 32000) ÷ 20 mA example: -15mA input WX = (-15 x 32000) ÷ 20 = -24000

Note:
Bit 15 is always returned as a zero, and bit 16 is employed as an over/underrange bit. Consequently, returned data values change by four.

1.10. Effect of Out-of-Range Input Signals: 13 Bit Mode

The Model 2558 utilizes the overrange and underrange bit to indicate when a channel has reached individual limits. The value of the overrange or underrange condition varies from channel to channel. The reason for this is that as a channel is calibrated, all of the gains and offsets and dynamic ranges of the analog to digital converter of the system are compensated for in each analog input channel. Therefore, the point at which the analog to digital converter reaches a saturation point and can no longer produce a change in counts for corresponding change in input signal is called the overrange or underrange limit of the channel. This level is different for every channel. In Figures 1.3 and 1.6, the limits for the overrange and underrange values are the minimum limits for a given channel. The actual limits for an individual channel may be greater.

1.10.1. Unipolar Mode

Signals falling below the lower limits in 0 to 5V Input Mode or 0 to 10V Input Mode are translated into a digital word that includes the addition of Bit 16 to indicate an overrange or underrange condition. The underrange capability of any channel in Unipolar Mode may produce a negative value to the PLC for a number of counts before the underrange bit is set.

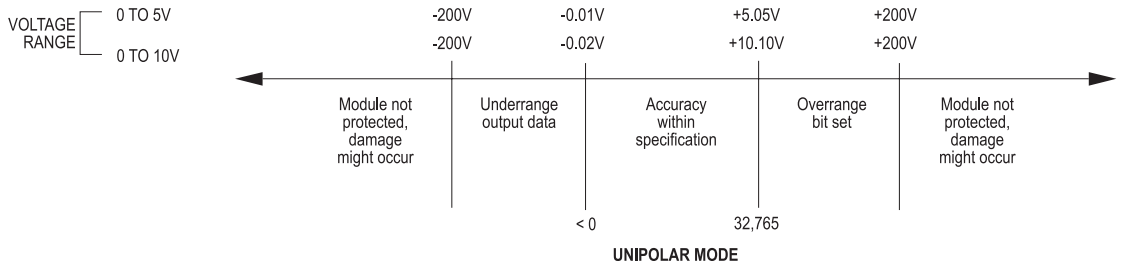


Figure 1.3 13 Bit Voltage Input Limits (Unipolar)

Figures 1.4 and 1.5 show the binary values of typical overrange and underrange conditions for Unipolar mode.

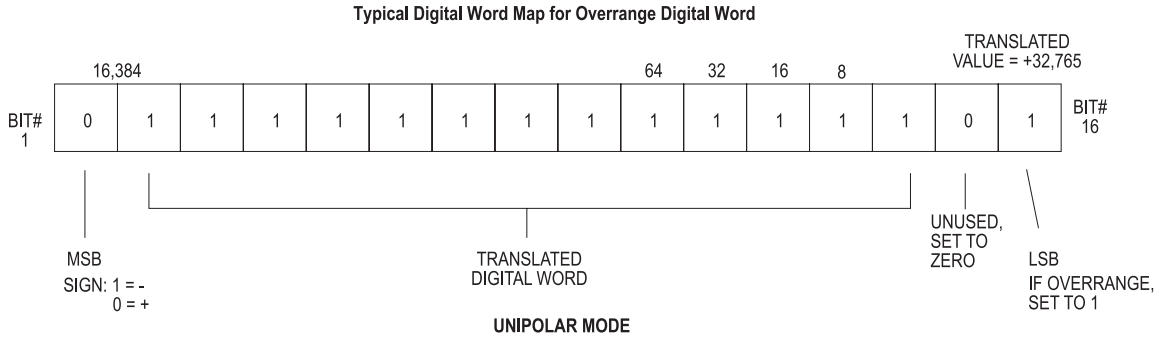


Figure 1.4 13 Bit Overrange Word Value (Unipolar)

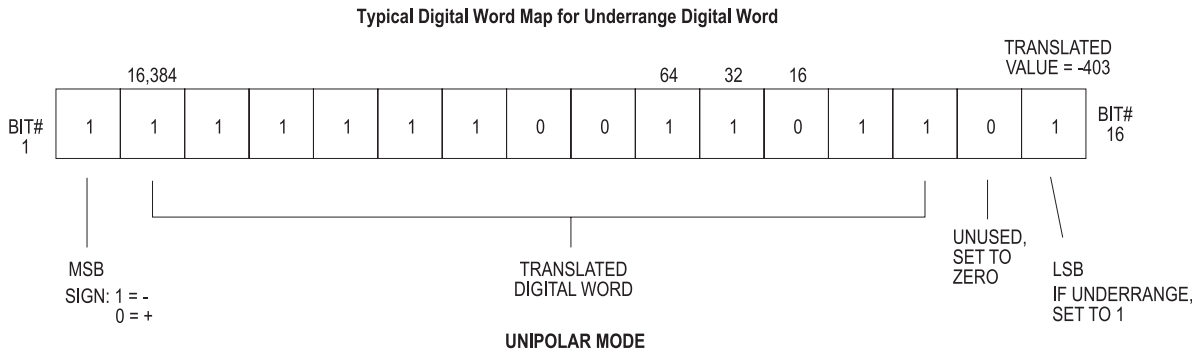


Figure 1.5 13 Bit Underrange Word Value (Unipolar)

1.10.2 Bipolar Mode

In Bipolar Mode signals above or below the upper and lower limits in the -5 to +5 VDC or -10 to +10 VDC range are translated to a digital word and also utilize the overrange and underrange bit. The actual limit for each channel will vary from channel to channel as described in the previous section.

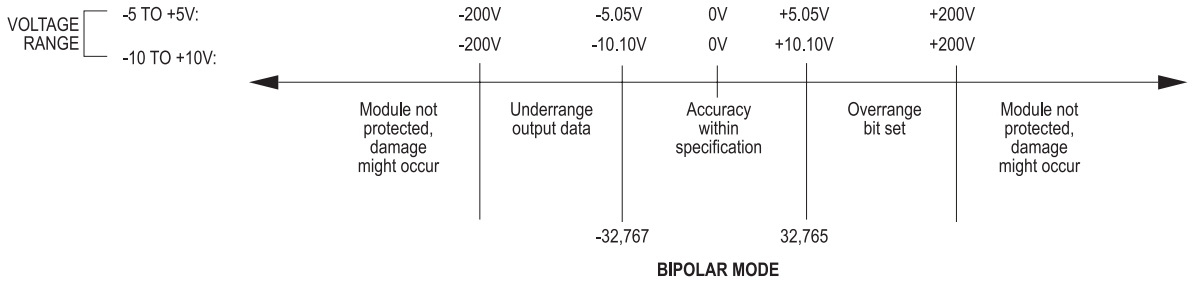


Figure 1.6 13 Bit Voltage Input Limits (Bipolar)

Figures 1.7 and 1.8 show the binary values of typical overrange and underrange conditions for Bipolar Mode.

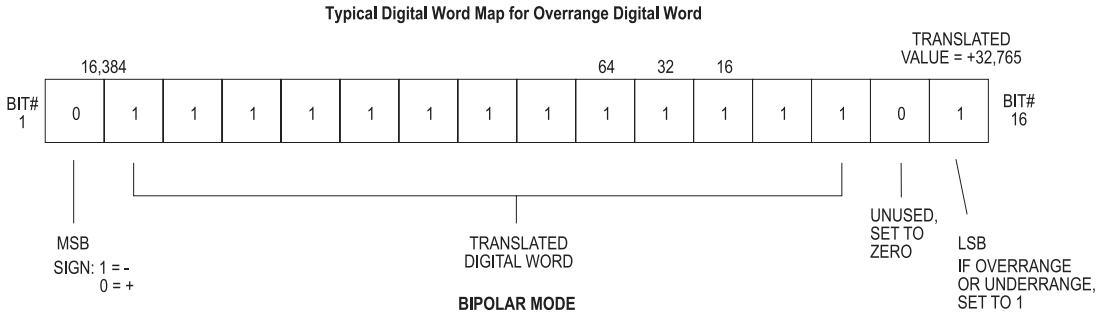


Figure 1.7 13 Bit Overrange Word Value (Bipolar)

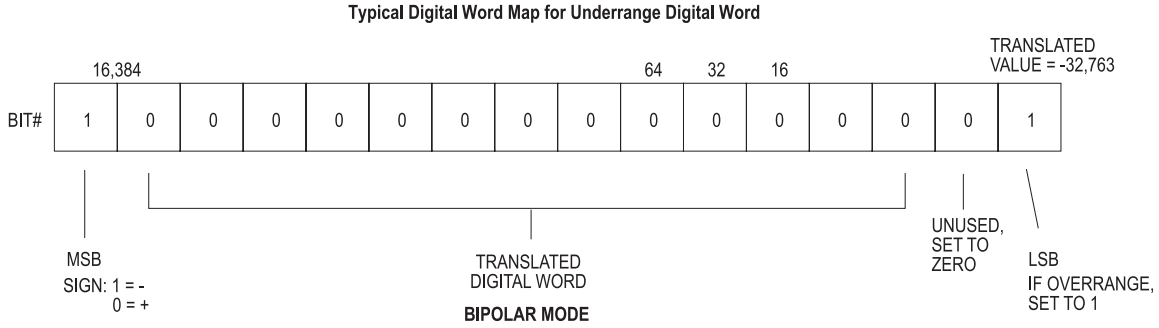


Figure 1.8 13 Bit Underrange Word Value (Bipolar)

1.11. Resolution: 13 Bit Mode

The module has a resolution of 4 counts out of 32000. This is the smallest unit into which the module will divide an input and is 1 part out of 8000. This relationship can be shown as:

4 counts per step ÷ 32000 counts full scale = 1/8000

When using the module with 20% offset, module resolution remains at 4 counts out of 32000, but offset resolution increases to 5 counts out of 32000 as a result of the multiplication and division of the incoming data word.

The chart below shows the corresponding input resolution per step for each of the input configuration modes:

	RANGE CONFIGURATION	DIGITAL COUNTS / STEP	INPUT RESOLUTION PER STEP
UNIPOLAR	0 - 5 VDC	4	0.625 mV
	0 - 10 VDC	4	1.25 mV
	0 - 20 mA	4	2.5 µA
UNIPOLAR WITH 20% OFFSET	1 - 5 VDC	5	0.625 mV
	4 - 20 mA	5	2.5 µA
BIPOLAR	-5 TO +5 V	4	0.625 mV
	-10 TO +10 V	4	1.25 mV
	- 20 to + 20mA	4	2.5 µA

Figure 1.9 Input Resolution: 13 Bit

1.12. Digital Word Map: 16 Bit Mode

An analog input signal is translated into a 15-bit plus sign bit digital word. Since the PLC requires a 15-bit input word, the 15-bit plus sign value from the converter is placed into a 16-bit word for transmittal to the PLC. As shown in the following figure one bit is used to show the sign of the word.

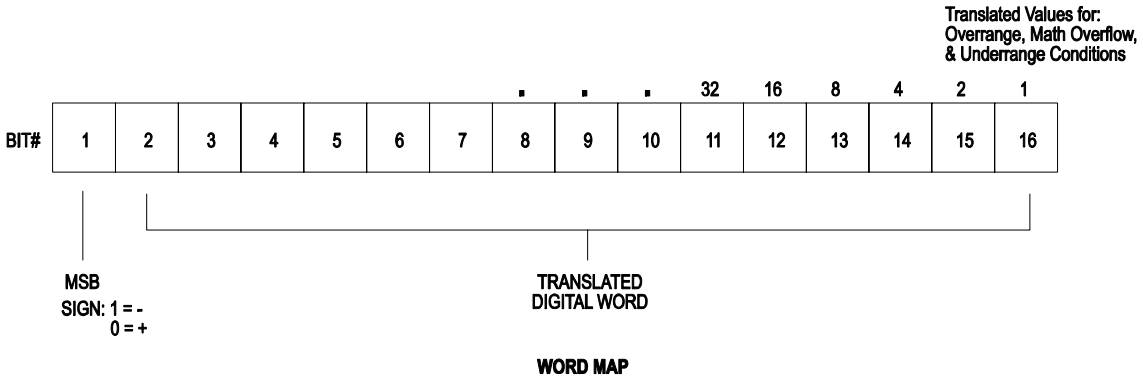

Translated Values for:
Overrange, Math Overflow,
& Underrange Conditions
32 16 8 4 2 1
BIT# 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
MSB
SIGN: 1 = -
0 = +
TRANSLATED
DIGITAL WORD
WORD MAP

Figure 1.10 16 Bit Word Input to the PLC from the Module

1.13. Analog to Digital Conversions: 16 Bit Mode

1.13.1. Unipolar Mode Conversion

The following equations may be used to calculate the digital word which will result from a particular voltage or current input in the Unipolar Input Mode:

0 to +5VDC range — Digital Word (WX) = (Input voltage x 32000) ÷ 5 volts
example: to generate an input voltage of 2.5 VDC, the WX value input to the PLC is calculated as follows: WX = (2.5 x 32000) ÷ 5 = 16000

0 to +10VDC range — Digital Word (WX) = (Input voltage x 32000) ÷ 10 volts
example: 7.5VDC input
WX = (7.5 x 32000) ÷ 10 = 24000

0 to +20mA range — Digital Word (WX) = (Input current x 32000) ÷ 20 mA
example: 10mA input
WX = (10 x 32000) ÷ 20 = 16000

1.13.2. Bipolar Mode Conversion

The following equations may be used to calculate the digital word which will result from a particular voltage or current input in the Bipolar Input Mode:

-5 to +5VDC range	Digital Word (WX) = (Input voltage x 32000) ÷ 5 volts example: to generate an input voltage of -2.5 VDC, the WX value input from the PLC is calculated as follows: WX = (-2.5 x 32000) ÷ 5 = -16000
-10 to +10V range	Digital Word (WX) = (Input voltage x 32000) ÷ 10 volts example: 10 VDC input WX = (10 x 32000) ÷ 10 = 32000
-20 to +20mA range	Digital Word (WX) = (Input current x 32000) ÷ 20 mA example: -15mA input WX = (-15 x 32000) ÷ 20 = -24000

1.14. Effect of Out-of-Range Input Signals: 16 Bit Mode

The Model 2558 utilizes the overrange and underrange code of 32757 and 32758, respectively, to indicate when a channel has reached individual limits. The value of the overrange or underrange condition varies from channel to channel. The reason for this is that as a channel is calibrated, all of the gains and offsets and dynamic ranges of the analog to digital converter of the system are compensated for in each analog input channel. Therefore, the point at which the analog to digital converter reaches a saturation point and can no longer produce a change in counts for corresponding change in input signal is called the overrange or underrange limit of the channel. This level is different for every channel. In Figures 1.11 and 1.14, the limits for the overrange and underrange values are the minimum limits for a given channel. The actual limits for an individual channel may be greater.

1.14.1. Unipolar Mode

Signals falling below the lower limits in 0 to 5V Input Mode or 0 to 10V Input Mode are translated into a digital word that outputs a specific code to indicate an overrange or underrange condition. The underrange capability of any channel in Unipolar Mode may produce a negative value to the PLC for a number of counts before the underrange code is produced.

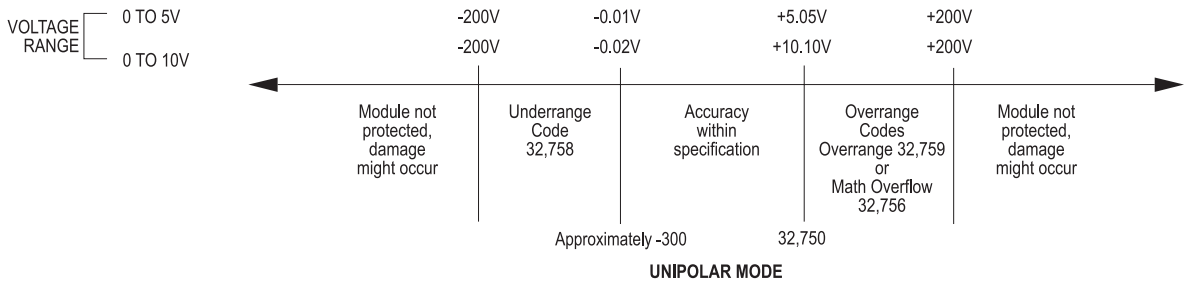


Figure 1.11 16 Bit Voltage Input Limits (Unipolar)

Figures 1.12 and 1.13 show the binary values of typical overrange and underrange conditions for Unipolar mode.

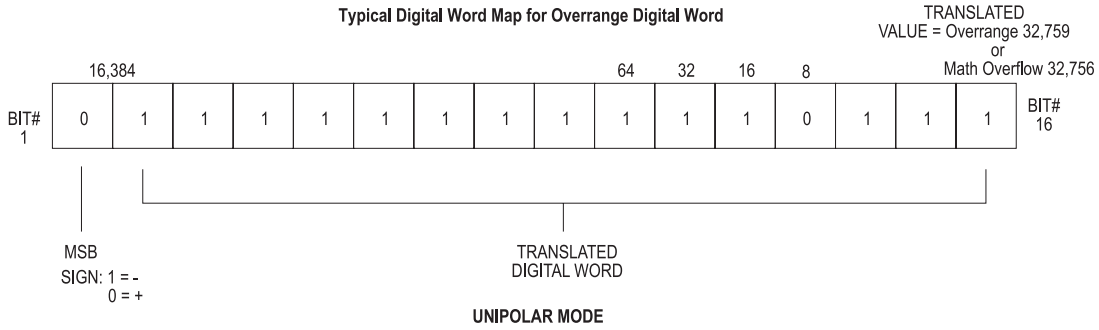


Figure 1.12 16 Bit Overrange Word Value (Unipolar)

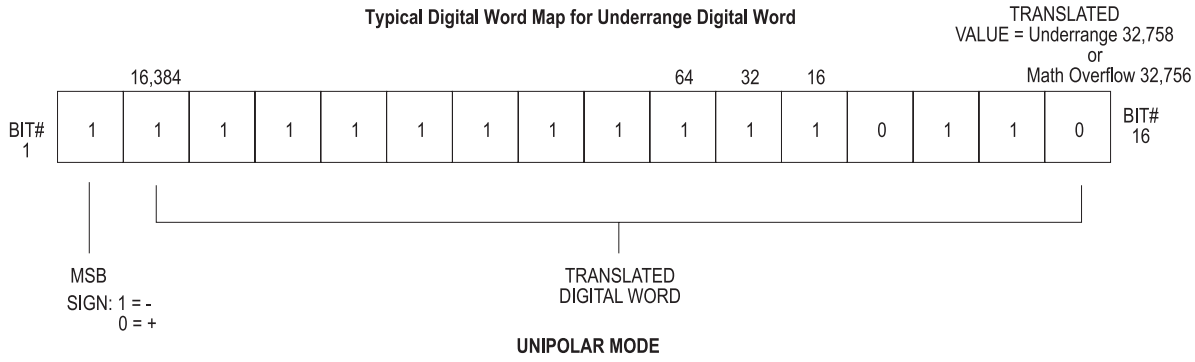


Figure 1.13 16 Bit Underrange Word Value (Unipolar)

1.14.2. Bipolar Mode

In Bipolar Mode signals above or below the upper and lower limits in the -5 to +5 VDC or -10 to +10 VDC range are translated to a digital word and also utilize the overrange and underrange values. The actual limit for each channel will vary from channel to channel as described in the previous section.

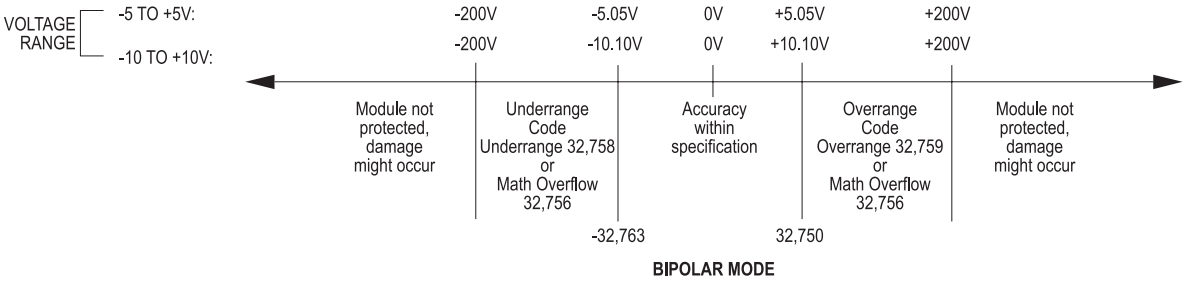


Figure 1.14 16 Bit Voltage Input Limits (Bipolar)

Figures 1.15 and 1.16 show the binary values of typical overrange and underrange conditions for Bipolar Mode.

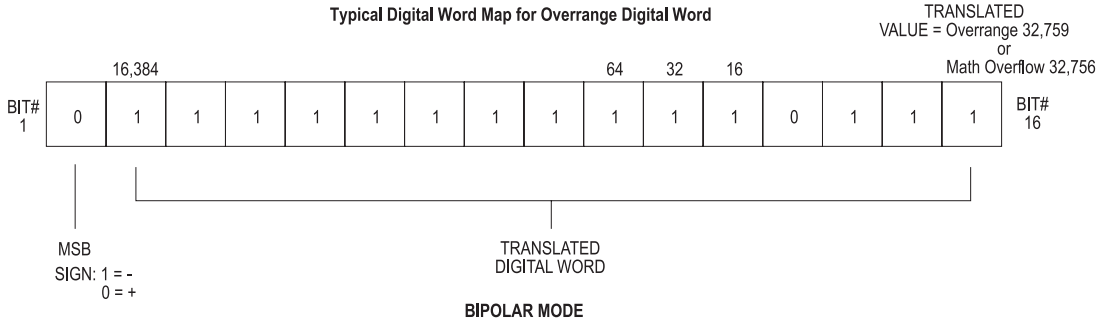


Figure 1.15 16 Bit Overrange Word Value (Bipolar)

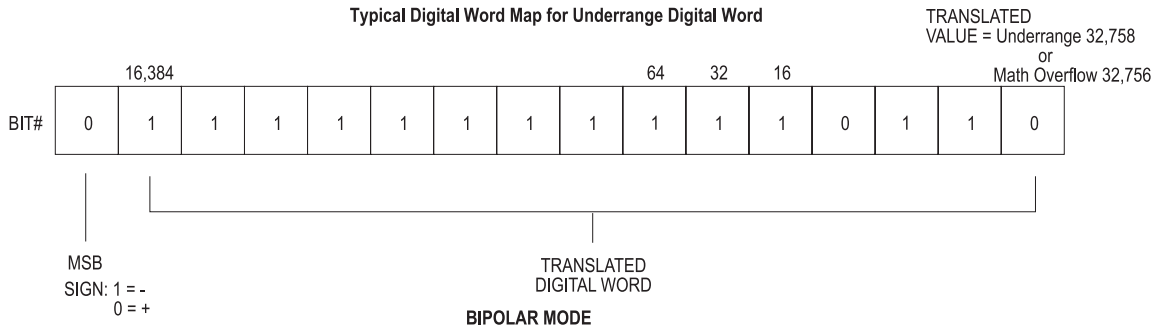


Figure 1.16 16 Bit Underrange Word Value (Bipolar)

1.15. Resolution: 16 Bit

The module has a resolution of 1 count out of 32000. This is the smallest unit into which the module will divide an input and is 1 part out of 32000. This relationship can be shown as:

1 count per step ÷ 32000 counts full scale = 1/32000

The chart below shows the corresponding input resolution per step for each of the input configuration modes:

	RANGE CONFIGURATION	DIGITAL COUNTS / STEP	INPUT RESOLUTION PER STEP
UNIPOLAR	0 - 5 VDC	1	156 µV
	0 - 10 VDC	1	312 µV
	0 - 20 mA	1	0.625 µA
UNIPOLAR WITH 20% OFFSET	1 - 5 VDC	1	156 µV
	4 - 20 mA	1	0.625 µA
BIPOLAR	-5 TO +5 V	1	156 µV
	-10 TO +10 V	1	312 µV
	- 20 to + 20mA	1	0.625 µA

Figure 1.17 Input Resolution: 16 Bit

CHAPTER 2. INSTALLATION

The installation of the Eight Channel Analog Module involves the following steps:

1. Planning the installation,
2. Unpacking and configuring the module,
3. Inserting the module into the I/O base,
4. Wiring and connecting the module input connectors,
5. Checking module operation.

The steps listed above are explained in detail in the following pages.

2.1. Planning the Installation

Planning is the first step in the installation of the module. This involves calculating the I/O base power budget and routing the input signal wiring to minimize noise. The following sections discuss these important considerations.

2.1.1. Calculating the I/O Base Power Budget

The Model 2558 requires 3.0 watts (maximum) of power from the I/O base. Use this value to verify that the base power supply is not exceeded.

2.1.2. Input Signal Wiring

Input signal wiring must be shielded twisted pair cable. A twisted pair will aid in the rejection of conducted and radiated interference from other energy sources. Standard practices usually require that all shields be tied together and grounded at a single point.

Note the following general considerations when wiring the module:

- Always use the shortest possible cables
- Avoid placing low voltage wire parallel to high-energy wire (if the two wires must meet, cross them at a right angle)
- Avoid bending the wire into sharp angles
- Use wireways for wire routing
- Avoid placing wires on any vibrating surface

2.2. Unpacking the Module

Open the shipping carton and remove the special anti-static bag which contains the module.

CAUTION:
HANDLING STATIC SENSITIVE DEVICES
The components on the Model 2558 module printed circuit card can be damaged by static electricity discharge. To prevent this damage, the module is shipped in a special anti-static bag. Static control precautions should be followed when removing the module from the bag, when opening the module, and when handling the printed circuit card during configuration.

After discharging any static build-up, remove the module from the static bag. **Do not discard the static bag. Always use this bag for protection against static damage when the module is not inserted into the I/O backplane.**

WARNING:
Ensure that the power supply is turned OFF before connecting the wires to the I/O base.

2.3. Configuring the Module

The Model 2558 must be configured for voltage or current inputs, voltage range, unipolar/bipolar mode, digital filtering/no filtering mode, return commonality, and 13 or 16 bit compatibility before wiring the input connectors and inserting the module into the I/O base. As shipped, all input channels are configured for current inputs, 5V range (see note below), unipolar mode, digital filtering enabled, offset scaling disabled, a common return, and 13 bit compatibility (see Figure 2.1).

NOTE:
The 5V input signal range configuration is used for both 0 to 5VDC and 1 to 5VDC or 0 to 20mA and 4 to 20mA input signal ranges.

Changing the module input channel configuration involves the following steps (notations in parenthesis are actual printed board titles) described in the following sections:

1. Selecting voltage (VOLTAGE) or current (20MA) input mode for each channel
2. Selecting 0 to 5V (5V) or 0 to 10V (10V) voltage range for each channel
3. Selecting unipolar (UNI) or bipolar (BI) input mode for each channel
4. Selecting digital filtering (EN) or no filtering (DIS) for the module
5. Selecting offset scaling (EN) or no offset (DIS) for the module
6. Selecting the 13 bit (13BIT) or 16 bit (16BIT) compatibility for the module
7. Configuring DIP switches to report the hardware selections to the microcomputer
8. Selecting channel return path as common (COM) or isolated (ISO)
9. Logging the configuration jumper settings for future reference

2.3.1. Selecting Voltage or Current Input Mode

Locate the 8 Voltage/Current Jumpers corresponding to input channels 1 through 8. See Figure 2.2 for the location of these jumpers. For each input channel, select current mode by placing the jumper in the “20MA” position or voltage mode by placing the jumper in the “VOLTAGE” position. For each input channel set to current mode, you must set the corresponding Voltage Range Jumper to the 5V position as described in the following section.

2.3.2. Selecting Voltage Range

Locate the Voltage Range Jumpers corresponding to input channels 1 through 8 (see Figure 2.2). For each input channel operating in current mode, set the corresponding Voltage Range Jumper to 5V.

CAUTION:
For each input channel configured for current mode, the corresponding Voltage Range Jumper must be set to 5V.

For each input channel operating in voltage mode, set the corresponding Voltage Range Jumper to “5V” for 0 to +5V or –5 to +5V input range or “10V” for 0 to +10V or –10 to +10V input range. As shipped, the 2558 is in “5V” range.

Channel Number	Voltage Current Jumper (Default: 20mA)	Voltage Range Jumper (Default: 5V)	Unipolar/Bipolar Jumper (Default: UNI)	Return Path Compatibility Jumper (Default: COM)
1	JP1	JP3	JP2	JP24
2	JP4	JP27	JP5	JP28
3	JP10	JP6	JP8	JP29
4	JP13	JP9	JP11	JP30
5	JP16	JP12	JP14	JP31
6	JP7	JP15	JP17	JP32
7	JP19	JP18	JP20	JP33
8	JP22	JP21	JP23	JP34

All Channels	Offset Scaling Jumper	Jumper Position	Digital Filtering Jumper	Jumper Position	Compatibility Mode Jumper	Jumper Position
1-8	JP40	DISABLED	JP25	ENABLE	JP26	13 BIT

Figure 2.1 Shipping Jumper Configuration Locations

2.3.3. Selecting Unipolar or Bipolar Input Mode

Locate the Unipolar/Bipolar Jumpers for each channel (see Figure 2.2). Set each jumper to “UNI” for unipolar operation or “BI” for bipolar operation for each input channel.

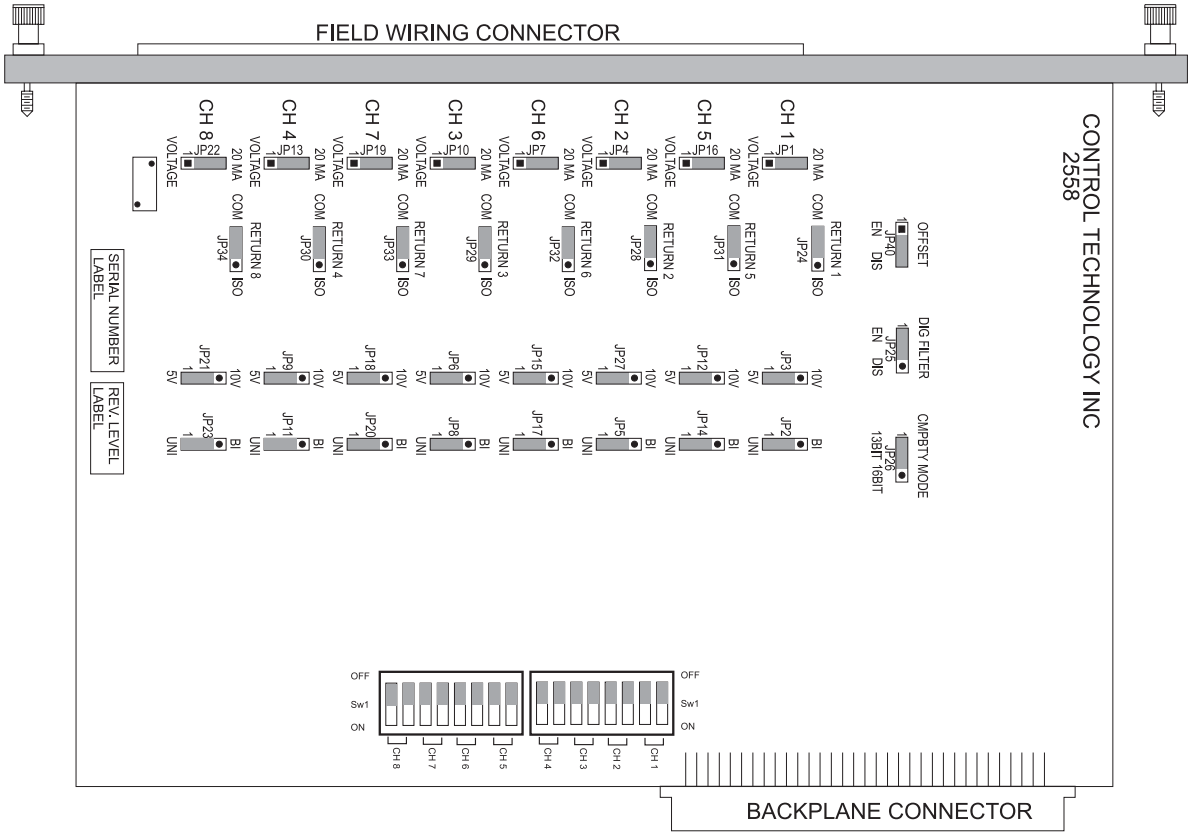


Figure 2.2 Configuration Jumper Board Locations
(jumper settings shown as shipped)

2.3.4. Selecting Digital Filtering

Locate the Digital Filtering Jumper “DIG FILTER” JP25 (see Figure 2.2). To enable digital filtering, set the jumper in the “EN” position; to disable, set to the “DIS” position. Since many analog input signals contain noise, CTI recommends using digital filtering unless maximum response time is required. As shipped, digital filtering is enabled for all 8 analog inputs.

2.3.5. Selecting Offset Scaling

Locate the Offset Scaling “OFFSET” jumper JP40 (see Figure 2.2). To enable offset scaling for all 8 inputs set the jumper to the “EN” position; to disable, set to the “DIS” position.

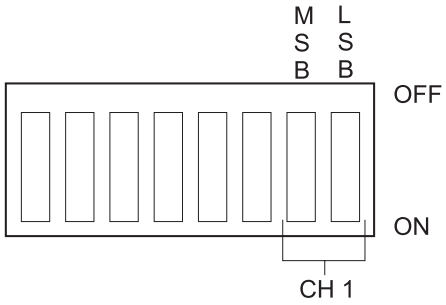
2.3.6. Selecting Compatibility Mode

Locate the Compatibility Mode “CMPBTY MODE” jumper JP26 (see Figure 2.2). To enable 16 bit compatibility mode for all 8 inputs set the jumper to the “16BIT” position. As shipped, the 13 bit compatibility mode is enabled.

2.3.7. Configuring Switches to Report Hardware Configuration

Once the hardware jumpers are selected this information needs to be reported to the microcomputer. The information is reported via DIP switches SW1 and SW2 (see Figure 2.2). Each output channel uses 2 switches with a BCD code to indicate the state of the hardware jumpers.

2 (MSB)	**1 (LSB)**	**Range**
OFF	OFF	Unipolar 5VDC
OFF	ON	Unipolar 10VDC
ON	OFF	Bipolar 5VDC
ON	ON	Bipolar 10VDC



NOTE:
The OFF position is selected by actuating the switch in the direction of the center of the printed circuit board.

NOTE:
Standard shipping configuration is all switches in the OFF position Unipolar 5VDC range.

2.3.8. Selecting Channel Return Path as Common or Isolated

Locate the return jumpers 1-8 (see Figure 2.2). To enable a common channel 1-8 return path, select the “COM” (common) position. To isolate individual channels, choose the “ISO” (isolated) position. As shipped, all 8 channels are in “COM” (common) mode.

2.3.9. Jumper Settings for Future Reference

See Appendix B. Jumper Settings Log Sheet to record any changes to the module’s jumper settings.

2.4. Inserting the Module into the I/O Base

Insert the module into the I/O base by carefully pushing the module into the slot. When the module is fully seated in the slot and backplane connector, tighten the captive screws at the top and bottom to hold the module in place. To remove the module from the I/O base, loosen the captive screws then remove the module from the I/O base. Be careful not to damage the edge card at the back of the module when inserting or removing the module.

2.5. Wiring the Input Connectors

Input signals are accepted through a connector assembly located on the front of the module. The connector assembly consists of a standard Siemens® front panel edge connector that mates with the printed circuit board. Wiring is connected to the front connector via recessed screw terminals. The screw terminals can accept wire sizes up to single stranded 14-gauge wire. The actual size used depends on the external device providing the input signal. Consult the device manufacturer's recommendations for selecting the input wire size.

To assign an input to a specific channel, locate the appropriate channel position on the screw terminal connector as shown in the following figure:

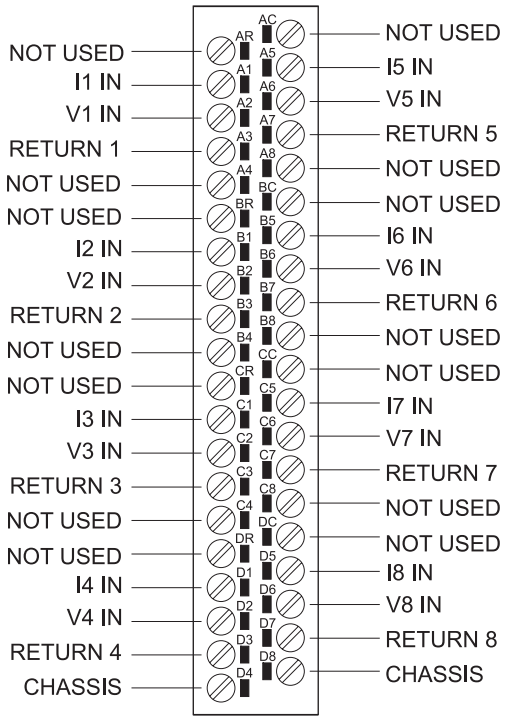


Figure 2.3 Screw Terminal Connector Wiring

2.5.1. Connecting Voltage Input Wiring

For voltage input circuits, connect the signal wire to the V# In screw terminal, and the return wire to the Return# screw terminal. Insert the wires in the appropriate holes on the front of the connector. When the wires are inserted, tighten the screws. Repeat this procedure for the remaining voltage input channels.

2.5.2. Connecting Current Input Wiring

For current input circuits, connect the signal wire to the I# screw terminal, and the return wire to the Return# screw terminal. Insert the wires in the appropriate holes on the front of the connector. When the wires are inserted, tighten the screws. Repeat this procedure for the remaining current input channels.

2.5.3. Connecting the Shield Wiring

Control Technology Inc. recommends that all wires be shielded twisted pair with a foil wrap shield and a separate drain wire and that they be installed in a metallic conduit. Use Belden cable 8761 or equivalent which contains a foil wrap shield and a separate drain wire. The shield and the foil wrap should be twisted together and should be terminated at only one end. The other end should be left in an open circuit condition. CTI recommends that the shield be terminated at the PLC end of the signal wire. Special components are installed on the module to aid in the rejection of noise.

When entering the industrial cabinet the shield should be routed from the main terminal strip all the way to the PLC. Signal leads that do not maintain a shield from the terminal strip to the PLC act as antennas and are susceptible to radiated and conducted emissions in the cabinet. Unprotected cables may introduce measurement errors in the module.

The front connector on the module contains a CHASSIS terminal which may be used for the shield wire if the installation is in a noise free environment. If the installation is in an extremely noisy environment CTI strongly recommends that the shielded wires terminated to the PLC chassis ground.

CTI has exhaustively tested this product to maximize its ability to reject noise from inductive sources as well as showering arcs, fast transients and other high frequency generators and has determined that the best performance results from connecting all shield wires together at the PLC module and terminating this single wire to the chassis ground with a large current capacity conductor. CTI recommends using a #8 gauge wire are larger from the PLC chassis to the earth ground connection.

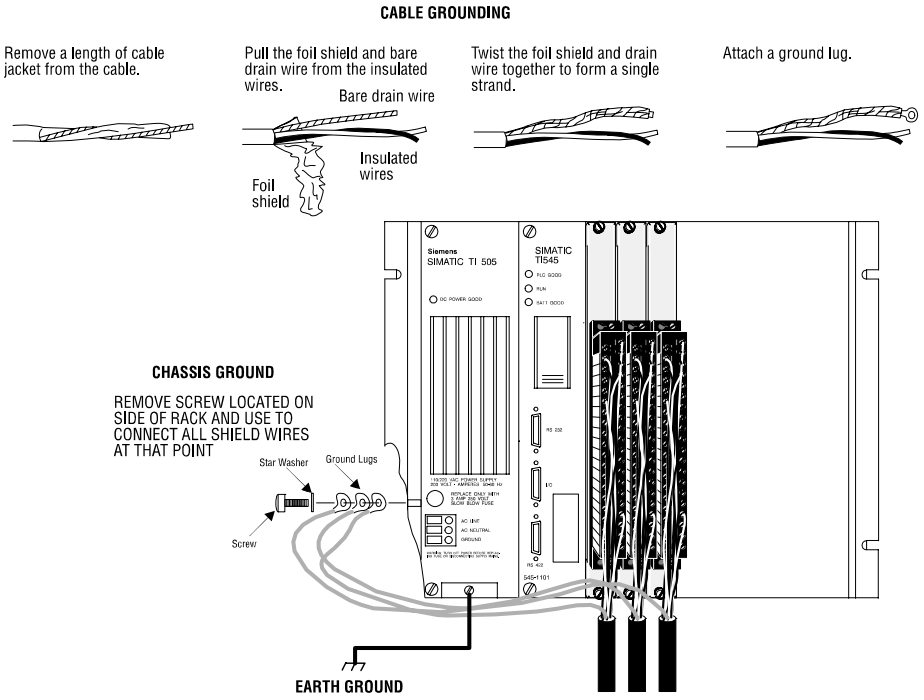

CABLE GROUNDING
Remove a length of cable jacket from the cable.
Pull the foil shield and bare drain wire from the insulated wires.
Bare drain wire
Insulated wires
Foil shield
Twist the foil shield and drain wire together to form a single strand.
Attach a ground lug.
Siemens
SIMATIC TI 505
SIMATIC
TI545
CHASSIS GROUND
REMOVE SCREW LOCATED ON SIDE OF RACK AND USE TO CONNECT ALL SHIELD WIRES AT THAT POINT
Star Washer
Ground Lugs
Screw
EARTH GROUND

Figure 2.4 Shield Wire Termination

2.6. Installing the Screw Terminal Connector

When all the input signal wires are connected to the screw terminal connector, carefully install the connector on the front of the module.

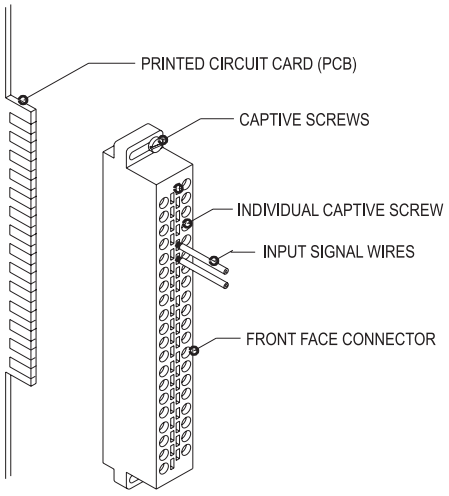


Figure 2.5 Input Connector Assembly

2.7. Checking Module Operation

First turn on the base power. If the module diagnostics detect no problems, the status indicator on the front of the module will light. If the status indicator does not light, begins blinking (or goes out during operation), the module has detected a failure. For information on viewing failed module status, refer to your TISOFT user manual. To diagnose and correct a module failure, refer to the next section on troubleshooting.

You must also check that the module is configured in the memory of the PLC. This is important because the module will appear to be functioning regardless of whether it is communicating with the PLC. To view the PLC memory configuration chart listing all slots on the base and the inputs or outputs associated with each slot, refer to your TISOFT Programming Manual. An example chart is shown in the following figure.

```
I/O MODULE DEFINITION FOR CHANNEL . . . 1    BASE . . . . . 00

              I/O    NUMBER OF BIT AND WORD I/O   SPECIAL
 SLOT  ADDRESS         X     Y     WX   WY       FUNCTION

  01 . . . . 0001 . . . . . . . . 00 . . 00 . . 08 . . 00 . . . . . . . NO
  02 . . . . 0000 . . . . . . . . 00 . . 00 . . 00 . . 00 . . . . . . . NO
                                  .
                                  .
                                  .
  15 . . . . 0000 . . . . . . . . 00 . . 00 . . 00 . . 00 . . . . . . . NO
  16 . . . . 0000 . . . . . . . . 00 . . 00 . . 00 . . 00 . . . . . . . NO
```

Figure 2.6 Example I/O Configuration Chart

In this example, the Model 2558 module is inserted in slot 1 in I/O base 0. Data for channel 1 appears in word location WX1, data for channel 2 appears in word location WX2, etc. For your particular module, look in the chart for the number corresponding to the slot occupied by the module. If word memory locations appear on this line, then the module is registered in the PLC memory and the module is ready for operation.

If the line is blank or erroneous, re-check the module to ensure that it is firmly seated in the slots. Generate the PLC memory configuration chart again. If the line is still incorrect, contact your local distributor or CTI at 1-800-537-8398 for further assistance.

CHAPTER 3. TROUBLESHOOTING

If the module provides improper readings or the status indicator is not on, use the following chart to determine the appropriate corrective action.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Indicator is not lit	Base power is off Defective module	Turn base on Return the module to CTI for repair
Indicator is blinking	Calibration data no longer stored in memory	Return the module to CTI for calibration
Incorrect inputs	Blown fuse Wrong addresses for word input	Return the module to CTI for repair Check program for correct word input addresses
	Not logged-in Incorrect jumper settings	Read I/O configuration Refer to Section 2.3 of this Installation & Operation Guide for jumper settings
	Incorrectly calibrated	Return the module to CTI for recalibration
	Noisy signal	Check for proper shield termination at input connectors
	Offset scale enabled	If JP40 is enabled all inputs are scaled for 4-20mA offset operation

Figure 3.1 Troubleshooting Matrix

CAUTION:
The module fuse F2 is not user serviceable. If this fuse is blown, the module has a serious component failure and should be returned to CTI for repair.

When it is inconvenient to visually check the status indicator, use the TISOFT "Display Failed I/O" or "Show PLC Diagnostics" support functions.

If after consulting the chart above, you are unable to diagnose or solve the problem, contact your local distributor or CTI at 1-800-537-8398 for further assistance.

HARDWARE SPECIFICATIONS

Input Channels:	8 analog input channels
Signal Range:	Unipolar: 0 to 5VDC, 0 to 10VDC, or 0 to 20mA Bipolar: -5 to +5VDC, -10 to +10VDC, or -20 to +20mA
Update Time:	8WX mode: 5 mSec all channels
Digital Filtering Time Constant:	0.3 Sec
DC Input Resistance:	Voltage Mode: 780kΩ Current Mode: 250Ω
DC Accuracy:	Voltage Mode: 0.125% of full scale from 0° to 60°C Current Mode: 0.225% of full scale from 0° to 60°C
Resolution (8WX Mode):	Unipolar: 15 bits plus sign: 0-5VDC range=156µV/step 0-10VDC range=312µV/step 0-20mA range=0.625µA/step Bipolar: 15 bits plus sign: -5 to +5VDC=156µV/step -10 to +10VDC range=312µV/step -20 to +20mA range=0.625µA/step
Common Mode Rejection:	>120db @ 60Hz (digital filtering disabled)
Normal Mode Rejection:	>40db @ 500 Hz (digital filtering enabled)
Connector:	Removable
Wire Gauge:	14-22 AWG
Input Protection:	Input ESD Protection: 20,000V, IEC 1000-4-2, level 4 Overrange Protection: +/- 300VDC
Isolation:	1500VDC channel-to-PLC
Module Size:	Single wide
Backplane Power Consumption:	3.0 Watts (maximum)
Operating Temperature:	0° to 60°C (32° to 140°F)

Storage Temperature:	-40° to 85°C (-40° to 185°F)
Humidity:	5% to 95% (non-condensing)
Agency Approvals Pending:	UL, ULC, FM (Class 1, Div 2) CE
Shipping Weight:	1.5 lb. (0.68 Kg)

Specifications subject to change without notice.

APPENDIX A. COMPATIBILITY WITH SIEMENS® 505-6108A/B

Overview

The CTI 2558 Analog Input Module was designed to be a drop-in replacement for the Siemens® models 505-6108-A and 505-6108-B. From set up of the module to wiring and PLC reporting, the user will find many similarities between the CTI and Siemens® models.

Using the CTI 2558 in a 505-6108-A and/or 505-6108-B application

The CTI 2558 should fulfill all the following requirements for the 505-6108-A and 505-6108-B replacement(s), as outlined below:

Module setup

Since the CTI 2558 allows for both Unipolar and Bipolar setup, the module does have a slightly different module setup. See Chapter 2.3 Configuring the Module for Operation to determine the details in module setup.

Wiring

The wiring of the input connector is the same between the module. See Chapter 2.5 Wiring the Output Connector for a detailed explanation of how this is accomplished.

PLC Reporting

The word format is the same between the modules. See Chapter 1 for a more detailed explanation on PLC reporting.

APPENDIX B. JUMPER SETTINGS LOG SHEET

Channel Number	Voltage Current Jumper (20mA or V)	Voltage Range Jumper (5V or 10V)	Unipolar/Bipolar Jumper (UNI or BI)	Return Path Compatibility Jumper (COM or ISO)
1	JP1:	JP3:	JP2:	JP24:
2	JP4:	JP27:	JP5:	JP28:
3	JP10:	JP6:	JP8:	JP29:
4	JP13:	JP9:	JP11:	JP30:
5	JP16:	JP12:	JP14:	JP31:
6	JP7:	JP15:	JP17:	JP32:
7	JP19:	JP18:	JP20:	JP33:
8	JP22:	JP21:	JP23:	JP34:

All Channels	Offset Scaling Jumper	Jumper Position	Digital Filtering Jumper	Jumper Position	Compatibility Mode Jumper	Jumper Position
1-8	JP40		JP25		JP26	

Record the configuration jumper settings on this log for future reference. Make additional copies if necessary.

LIMITED PRODUCT WARRANTY

CTI warrants that this CTI Industrial Product shall be free from defects in material and workmanship for a period of one (1) year after purchase from CTI or from an authorized CTI Industrial Distributor. This CTI Industrial Product will be newly manufactured from new and/or serviceable used parts which are equal to new in the Product.

Should this CTI Industrial Product fail to be free from defects in material and workmanship at any time during this (1) year warranty period, CTI will repair or replace (at its option) parts or Products found to be defective and shipped prepaid by the customer to a designated CTI service location along with proof of purchase date and associated serial number. Repair parts and replacement Product furnished under this warranty will be on an exchange basis and will be either reconditioned or new. All exchanged parts or Products become the property of CTI. Should any Product or part returned to CTI hereunder be found by CTI to be without defect, CTI will return such Product or part to the customer.

This warranty does not include repair of damage to a part or Product resulting from: failure to provide a suitable environment as specified in applicable Product specifications, or damage caused by an accident, disaster, acts of God, neglect, abuse, misuse, transportation, alterations, attachments, accessories, supplies, non-CTI parts, non-CTI repairs or activities, or to any damage whose proximate cause was utilities or utility like services, or faulty installation or maintenance done by someone other than CTI.

Control Technology Inc. reserves the right to make changes to the Product in order to improve reliability, function, or design in the pursuit of providing the best possible Product. CTI assumes no responsibility for indirect or consequential damages resulting from the use or application of this equipment.

THE WARRANTY SET FORTH ABOVE IN THIS ARTICLE IS THE ONLY WARRANTY CTI GRANTS AND IT IS IN LIEU OF ANY OTHER IMPLIED OR EXPRESSED GUARANTY OR WARRANTY ON CTI PRODUCTS, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE AND IS IN LIEU OF ALL OBLIGATIONS OR LIABILITY OF CTI FOR DAMAGES IN CONNECTION WITH LOSS, DELIVERY, USE OR PERFORMANCE OF CTI PRODUCTS OR INTERRUPTION OF BUSINESS, LOSS OF USE, REVENUE OR PROFIT. IN NO EVENT WILL CTI BE LIABLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR CONSUMER PRODUCTS, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY FROM STATE TO STATE.

REPAIR POLICY

In the event that the Product should fail during or after the warranty period, a Return Material Authorization (RMA) number can be requested orally or in writing from CTI main offices. Whether this equipment is in or out of warranty, a Purchase Order number provided to CTI when requesting the RMA number will aid in expediting the repair process. The RMA number that is issued and your Purchase Order number should be referenced on the returning equipment's shipping documentation. Additionally, if the product is under warranty, proof of purchase date and serial number must accompany the returned equipment. The current repair and/or exchange rates can be obtained by contacting CTI's main office at 1-800-537-8398.

When returning any module to CTI, follow proper static control precautions. Keep the module away from polyethylene products, polystyrene products and all other static producing materials. Packing the module in its original conductive bag is the preferred way to control static problems during shipment. Failure to observe static control precautions may void the warranty. For additional information on static control precautions, contact CTI's office at 1-800-537-8398.